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Chapter 4: Who, What, When, Where, Why

1. Why do you think that Melanie Mitchell titled this chapter "Who, What, When, Where, Why?" Please do your best to articulate what you believe she was trying to convey with this title.

   The chapter title is trying to demonstrate how much information humans can discern quickly which an AI or computer cannot. This is the main difference between human intelligence and AI, The amount of information we can parse from stimulus.

2. TRUE or FALSE: We humans perform vast amounts of information processing in hardly any time at all, and we have very little, if any, conscious awareness of what we're doing or how we do it.

   True

3. What ability does Melanie Mitchell suggest would be one of the first things we would require for general human level intelligence?

   The ability to discern the vast amount of information we casually do from a photo.

4. Describe the "object recognition" problem?

   The object recognition is about how one object, like a dog, can look different in many significant ways even though it's the same object. There is lighting, angles, other obstacles that can drastically affect how an image is interpreted that we don't normally think of.

5. TRUE or FALSE: Object recognition is typically so immediate and effortless for us as humans that it didn't seem as though it would be a particularly hard problem for computers, until AI researchers actually tried to get computers to do it.

   True

6. TRUE or FALSE: Prior to the deep-learning revolution, the major job of computer-vision researchers was to develop specialized image-processing algorithms that would identify "invariant features" of objects that could be used in their recognition.

   True

7. TRUE or FALSE: The ability of machines to recognize objects in images and videos underwent a quantum leap in the 2010s due to advances in the area called deep learning.

   True

8. TRUE or FALSE: The "traditional" multilayer neural networks were inspired by the brain, but their structure is very un-brain-like. In contrast, the neural networks dominating deep learning are directly modeled after discoveries in neuroscience.

   True

9. In just a few sentences, say something about David Hubel and Torsten Wiesel, and their contribution to the topic of this chapter.

   Hubel and Wiesel contributed the idea of hierarchical nature in the brains imaging ability. There is a certain way in which our eyes gather and transfer information to our brain.

10. In just a few sentences, say something about Kunihiko Fukushima, and his contribution to the topic of this chapter.

    Fukushima contributed the concept of cognitron and neocognitrons. The first image recognition programs that were essential in later deep neural network programs.

11. In just a few sentences, say something about Yann LeCun, and his contribution to the topic of this chapter.

    Inspired by Fukushima's cognitron's, LeCun proposed ConvNets which used an array of numbers to determine values in an image.

12. TRUE or FALSE: Like the neocognitron, the design of ConvNets is based on several key insights about the brain's visual system that were discovered by Hubel and Wiesel in the 1950s and 60s.

    True

13. Layers in a traditional deep learning network consist of a list of simulated neurons (units). Not so with a convolutional neural network. Describe a layer in a convolutional neural network.

    A layer in a deep learning network calculates the confidence of input then predicts and updates weight.

14. What do you think is the most salient similarity between object recognition in the brain and in convolutional neural networks?

    Detecting objects from overall structure to smaller features.

15. Describe the "receptive field" of a simulated neuron (unit) in a convolutional neural network.

    The receptive field is an area of an image that is objectified to a weight and sum.

16. How do you calculate the "convolution" associated with simulated neuron (unit) in a convolutional neural network.

    Multiply the elements in a receptive field and the weight and sum

17. TRUE or FALSE: An "activation map" in a convolutional neural network is constructed by computing the convolution for each simulated neuron (unit) in the map with respect to some "magically determined" feature. (For this question, think of magic as so many science fiction writers do, as "anything enabling actions beyond our current capability to understand them.")

    True

18. What analogy does Melanie Mitchell explore in the text by way of illustrating the the ideas associated with "maps" in convolutional neural networks?

    She uses the example of maps of Paris and how they focus on different features in the city

19. TRUE or FALSE: A convolutional neural network, like the brain, represents the visual scene as a collection of maps, each reflecting the specific "interests" of a set of feature detectors.

    True

20. TRUE or FALSE: Determining the number of "layers" in a ConvNet and the number of "maps" in a layer of a ConvNet is part of the art of getting these complex networks to work for a given task.

    True

21. Melanie Mitchell recalls I. J. Good's vision of a future "intelligence explosion" in which machines themselves create increasingly intelligent machines, and then proceeds to mention that with respect to convolutional neural networks we are not there yet. What do you think of the idea of using genetic algorithms as an "AI vehicle" by which to get us there? That is, what do you think of the possibility of employing a genetic algorithm to play the role of "ConvNet artist" in determining the architecture of a convolutional neural network to solve a particular problem?

    I think it is almost an inevitable possibility. Natural evolution has brought us to a point where it seems almost a natural next step. I am reminded of Isaac Asimov's "The Last Question" where a computer gets to a point that it begins upgrading itself and life begins revolving around it.

22. Describe the "classification module" for a convolutional neural network.

    The classification module is a neural network that uses the highest convolutional layer to output a confidence rating of what the image that is input is.

23. Describe the process of training a convolutional neural network.

    A convolutional neural network Is trained by being given large amounts of information in a specific category. Using back propagation the network's ability is tweaked to become efficient in determining information in that category.

24. TRUE or FALSE: Even though convolutional neural networks are not constrained by a programmer to learn to detect any particular feature, when trained on large sets of real-world photographs, they indeed seem to learn a hierarchy of feature detectors similar to what Hubel and Wiesel found int the brain's visual system.

True

25. What concurrent technological revolution made possible the extraordinary ascent of convolutional neural networks from relative obscurity to near-complete dominance in machine vision?

Big Data